

An Impact Evaluation of Mass Replacement of School Principals in Georgia

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Abstract

This paper investigates how a unique education policy positively affected university enrollment rates of public school students in Georgia. In 2007, the Georgian government enacted legislation mandating the replacement of all public school principals under the assumption that the replacement of the principals with randomly assigning qualified candidates to public schools would fairly decentralize and improve school governance across Georgia. About half of public school principals were actually replaced with new candidates and a majority of them were assigned through a random allocation mechanism. Therefore, the standard difference-in-differences methodology is used to compare treated public schools with private schools that are not affected by the policy in order to identify how this reform impacted education outcomes. Using the National Assessment and Examination Center university admissions data, the public schools with replaced principals increased university enrollment more than the control schools by an average of 4%. The largest part of this increase comes from schools with randomly assigned principals. The positive findings herein could tenably impact education policy in developing (and perhaps developed) countries and elicits further research where applicable. The statistically significant and strong effects of this type of reform could cause a positive domino effect in the developing world, especially in countries with similar characteristics and predicaments in their education system.

JEL classification: H4, I210, I280, J45

Key words: School principals, university enrollment rate, education reform, random assignment

Introduction

This paper investigates whether a unique education policy positively affected university enrollment rates of public school students in Georgia. Under the Georgian political initiative to decentralize school governance, the Ministry of Education and Science issued an order (N543) in July 2007, officially dismissing all public school principals and subsequently “randomly” assigning qualified candidates to public schools across the country, under the assumption that the replacement of the principals with randomly assigning qualified candidates to public schools would fairly decentralize and improve school governance across Georgia. About half of the public school principals were actually replaced with new candidates, a majority of whom were assigned through a random allocation mechanism.

Accordingly, this paper uses a standard difference-in-differences methodology to compare treated public schools with private schools that are not affected by the policy, in order to identify how this reform impacted education outcomes. Using the National Assessment and Examination Center university admissions data, it can be seen that the public schools with replaced principals increased university enrollment more than the control schools by an average of 4%. The largest part of this increase comes from schools with randomly assigned principals.

The positive findings herein could impact education policy in developing (and perhaps developed) countries and invites further research where applicable. The statistically significant

and strong effects of this type of reform could cause a positive domino effect in the developing world, especially in countries with similar characteristics and predicaments in their education system.

The main objective of any school system is to improve student learning outcomes, cognitive skills, and socialization in society. In order to reach this objective and make schools more efficient, specific efforts are made by classrooms teachers and principals school-wide. It is widely believed (Branch et al, 2012; Bloom et al., 2015 and Oduro et al, 2007) that the quality of the principal plays an important role in a school's organizational success, as well as significantly affecting student scholastic achievements.

As the majority of schools are financed by the government in most countries (including Georgia), public finance efficacy makes it necessary to create and implement policies which ensure that the highest quality principals are selected (or assigned) to public schools.

School governing mechanisms vary significantly across developed and developing countries (Day and Sammons, 2013). In the developing world, many countries continue to maintain a centralized governance of schools, while other countries have taken steps towards decentralization (Patrinos and Fasih, 2009). Recently, much interest has been devoted to post-communist countries where the totalitarian regime collapsed and the countries started building their own policies independently. The state of Georgia is one of the most studied countries among the former Soviet states. Indeed, Georgian government reforms implemented since 2003

have received considerable attention from researchers and policy makers worldwide (The World Bank, 2012).

Georgian Education Reform of 2007

Georgia became a sovereign state in 1991 and has since experienced unstable economic and political transition periods. In 2003, a reformist government took power through the Rose Revolution with the aim of modernizing the state, eliminating corruption, ensuring equal opportunities, and stabilizing the political-economic situation. The new government launched reforms in almost all systems of governance ranging from law enforcement to healthcare, including the decentralization of public school governance from the state.

The Georgian governmental reform of the secondary school system was implemented as follows: First, the public financing of elementary and secondary education was replaced with an enrollment-based voucher system.² Following the initiative of the Ministry of Education and Science, each public school then elected a local governing board,³ which consisted of the principal, vice-principals, teachers, parents, and student representatives. The 2006 initiative's reorganization of school management paved the way for the principal replacement reform, with the government aiming to replace all public school principals in 2007. The Ministry of Education and Science officially dismissed all public school principals and announced a public tender for

² This reform was uniform to all schools in Georgia. Each school received funds in an amount equivalent to the enrollment voucher times the number of students.

³ Teachers, parents, and students were given the opportunity to participate in schools' governance. This reform concerned only public schools.

the open positions, that included a skills based exam, an interview process, and the combination of a meritocratic and random assignment mechanism.

More specifically, the Ministry of Education and Science took the following steps:

1) The Ministry dismissed all public school principals and announced an open tender for new leaders. The potential candidates (job seekers) registered themselves in a single administrative district in which they would compete for a principal position. There were a total of 2200 open positions in 68 districts. The registered candidates took a comprehensive, four-component examination⁴ followed by individual, in-person interviews with regional representatives of the ministry.

2) Based on the results of the standardized examination and passing the individual interviews, 5500⁵ candidates advanced to the final step in the hiring/replacement process. The examination evaluated not only literacy levels but managerial skills. The content of each test covered managerial theories, such as resource management and planning for education. While this exam may not be a perfect proxy for principal ability, it was designed by the Georgian government to best appraise the knowledge and skills deemed most appropriate and necessary for principal success.

3) The meritocratic part of the process gave the top 20% of approved candidates from each district the right to designate the school where they would undergo the final step—an interview with the school’s local governing board. Each school had a maximum of three candidate slots

⁴ The examinations were in General Skills, Georgian Language, Law, and Case Study Analysis.

⁵ This number is approximately a third of all initial participants.

available. When more than three of the top 20% candidates expressed interest in the same school, their test results were sorted and priority was given to the higher scorers.⁶ Each top 20% candidate could choose only one school. However, if higher ranking candidates filled all three slots of their selected school, the candidate was permitted to name another target school; a process which repeated until all top 20% scorers had been assigned to a school. This important mechanism of the design removed the incentive for candidates to strategically choose schools based upon their ranking (thus eliminating a serious potential source of endogeneity from this natural experiment). While self-selection endogeneity remains in terms of these candidates choosing schools with better socio-economic conditions and/or where they strategically expected to have a better chance of obtaining the position due to social ties, this is directly accounted for in the conclusions to this study. The bottom 80% of candidates were assigned by a random allocation mechanism (by lottery) to the remaining vacant slots in the final step—an interview with the local governing board. The lottery was transparent and all candidates had the opportunity to watch the results in real time.

4) The local governing board of each school made the final selection decision. Each candidate underwent a single interview and was either chosen as the new principal or was dismissed from the process. The selection of a candidate depended solely on the decision of the governing board. A rejection of all three candidates resulted in the dismissed principal retaining his position until the next round of the replacement reform process.⁷

⁶ Priority of slot allocation was always based on the results of the test and individual interview.

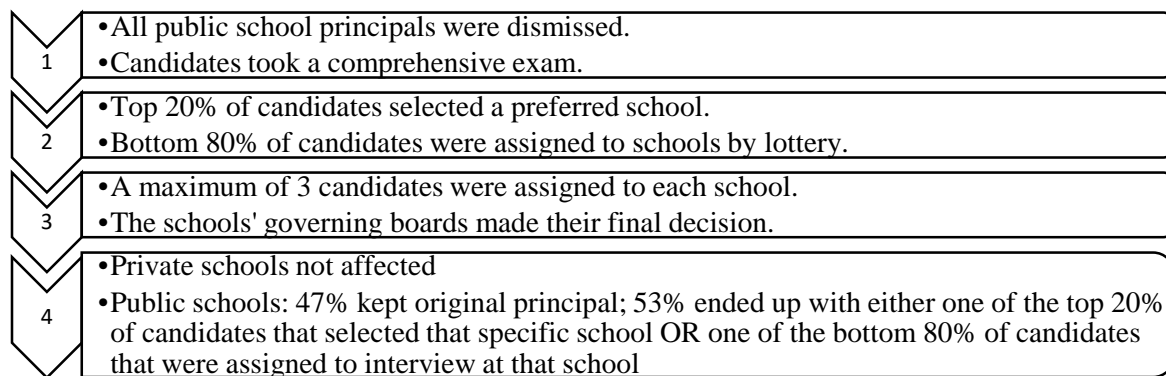
⁷ Next round of the principals' replacement took place in 2011 and in case the principal resigned before the next rotation, the Ministry of Education had the right to assign a new candidate to the school.

Ministry representatives carefully monitored all processes to avoid nepotism or the intentional rejection of candidates in order to retain the incumbent principals. Only 53% of public schools selected new principals with 5-year terms based on the new policy. The remaining 47% of public schools kept the existing principals. Unfortunately, as the data does not specify the identities of the candidates, there is no way to assess how many or which schools had the incumbent principal as one of their candidates.

However, based upon the replacement mechanism design, the number of principals who could retain their position through successfully passing the exam as a top 20% principal, and thus who had the ability to choose the school where they had previously worked, cannot be large or significantly affect this analysis.

New principals began their administration from the 2007/2008 academic year. The entire process is shown in the chain of blocks below.

Illustration: Steps of Education Reform in 2007



Overall, the reform represented a major transformation of the system and consisted, in part, of a randomization mechanism for the allocation of the candidates that scored in the bottom 80% of the approved participants. Unfortunately, there is no comprehensive description explaining why the principals retained their positions in 47% of the schools. However, Ministry officials publicly disclosed the top two reasons incumbent principals remained in many rural and ethnic minority schools, which made up the vast majority of schools where the reform did not lead to a change of principal. While the most common reason at rural schools was a lack of candidates, at ethnic minority schools the linguistic issues were the most significant barriers to policy implementation.

The reform resulted in the partitioning of all Georgian schools into four different groups:

- A) Private schools that were not affected by the policy.⁸
- B) Public schools that did not replace the existing principal (47% of schools).⁹
- C) Public schools that chose one of the top 20% candidates that specified their school of preference (27% of schools).
- D) Public schools that chose one of the randomly assigned (by lottery) candidates from the bottom 80% of those that passed the exam (26% of schools).

⁸ The convincing reason the reform would not change the behavior of the private schools' principals is compensation. Private sector principals are better paid than public sector principals. Unfortunately, the data did not provide information about teacher and student mobility between public and private schools.

⁹ Group B contains both the schools that chose their former principal as well as those that rejected all applicants. As discussed earlier, the former cannot make up any significant portion of the whole group.

Since the majority of newly elected principals (based on standardized test scores and passing the in-person interview) were assigned through a random allocation mechanism (by lottery), the reform offers a quasi-natural experiment that partitioned schools into control (group A) and treatment groups (groups B, C, and D, where only group D is randomly assigned).

Literature and Contribution

A major part of the empirical literature that studies the characteristics of effective school governance focuses on principals. Leadership is often considered a main factor in the organizational success of schools and it is believed that it has direct and indirect effects upon student academic performance. Indirectly, principals may promote student outcomes through enhancing conditions for teaching and learning (infrastructure, safety, monitoring, etc.). Directly, school leaders could have an impact on teaching quality through teacher turnover and training (Day & Sammons, 2013; Robinson et al., 2009). Usually, it is difficult to disentangle the causal effect of school principals on learning outcomes (Branch et al, 2012), because schools are heterogeneous and leadership might contribute less at schools of higher quality and vice versa. Although some variation in student/school learning outcomes is attributed to principals, no consensus exists on the amount or the mechanism of how principals impact the educational outcomes within/across schools.

Literature on school leadership in developing countries also focuses on principals, their role in managing schools, ‘plant-level’ management tasks, and on external reform initiatives promoted by governments. Bloom et al. (2015) find a strong association between the quality of a

principal and the learning outcomes of pupils. They surveyed 1800 schools across 8 countries (including developed) and concluded that higher management quality is strongly associated with better educational outcomes, with half of the variation being attributed to principal leadership and school governance.

As education systems vary across countries due to cultural diversity, it is important to study this concept in the within-country context (Heck 1996). Systemic reforms in school governance in developing countries have attracted many scholars who have pointed towards the importance of principals. Studies demonstrate that school leaders still face non-bureaucratic challenges even after decentralizing policies have been implemented in developing countries (Oplatka, 2004). However, there are only a handful of studies available on the effectiveness of school leaders in developing countries (Oduro et al, 2007), which makes new evidence based analyses necessary.

Compared to existing studies, this work investigates a large-scale, unique, and partially exogenous variation of principal turnover and its effect on school outcomes. In addition, it exploits the fact that the reform replaced a majority of the principals through a lottery mechanism, which makes the reform unique and worth studying.

Moreover, this paper is the first study of this particular education reform policy in Georgia, and it investigates the effects of this education policy on scholastic achievement. At the time of this reform, however, no standardized exams, such as the secondary school final exams that were implemented in the 2010/2011 school year, were taken by the students affected by this

reform. Therefore, Georgian university enrollment rates are employed as a proxy for this measure. There are two advantages of studying university enrollment rates: 1) it proxies the student's scholastic achievement as well as willingness and ability to acquire higher education and increase human capital and 2) it is the most accurate and universal measure covering the full panel of schools throughout the years of the study. Furthermore, there is no other measure that would uncover the school level dynamics of scholastic achievements in Georgia. Using standard Difference-In-Differences (DID) methodology, the results show that the public schools with replaced principals increased university enrollments by an average of 4% more than the control schools.

Interestingly, the results also reveal the importance of the assignment mechanism. The largest part of this increase comes from schools with lottery assigned principals. Those public schools where the principals were replaced through random assignment performed better in terms of university admissions (6% more than control) than those schools that had principals who were able to influence their school assignment. Specifically, schools with replaced principals (groups 3 and 4) improved their academic standing by 6.4 % and the schools with the lottery assigned principals (group 4) increased the relative enrollment rate by 9.5%. Given that the national average enrollment rate¹⁰ is 63%, this reform produced considerable gains.

In addition, this paper investigates the school choice preferences of principals. The results show that, with respect to the year before the reform, there is no significant difference between

¹⁰ Enrollment rate is the share of applicants who were admitted.

the university enrollment rates of the schools with principals from the quantile above the threshold (principals who chose the schools) and schools with principals from the quantile just below the threshold (who were assigned based on random allocation). In Georgia, the roles of principals are almost the same as in most other countries (improve learning environments, monitor the teaching process, administration, etc.), but there is a cultural specificity in terms of the education system and schooling, i.e. the magnitude of the social connections is probably higher than the international average. It is assumed that randomly assigned principals lack social and political ties at the school, which allows for more intra-school reform, while the principals who chose the schools are less likely to enact significant reforms due to likely existing political ties. Evidence of this effect exists, but is not a documented variable in the dataset.

Furthermore, covariate plots between the groups show that there is a selection effect occurring, with the top 20% principals choosing already better schools in terms of socio-economic characteristics. Along with the DID results, these findings indicate that the average lottery assigned principal was able to improve their school's university enrollment rate more than the average principal who was able to influence their school assignment. However, it is unclear which underlying mechanisms are causing which effects.

Data

To assess the effect of the principal on school-level scholastic achievements, nation-wide standardized university admissions data from 2005 to 2010 were used to compile university enrollment rates and were linked to the principals of the schools. The school level university

enrollment rate is a proxy of student scholastic achievement as well as willingness and ability to pursue higher education after graduating from secondary school. The necessary data was acquired from the National Assessment and Examination Center (NAEC), affiliated with Georgia's Ministry of Education and Science. The NAEC collects data annually on student admissions, entry examinations, and scholarship allocations related to accredited universities in Georgia. Since the 2005 reform, secondary school graduates who wish to enter university take mandatory exams (unified tests) on general skills, Georgian, a foreign language, and a fourth subject corresponding to the student's specialization.

Table 1 below shows the numbers of schools with students (at least one student) registered for university admission exams administered by the NAEC for the 2005-2010 periods. Schools are categorized based on the reform partitioning. There are four different groups of schools in the sample. Private schools (no direct effect from the policy), public schools without principal replacement, public schools with replacement of principals by top 20% candidates, and public schools with principal replacement by lottery candidates (bottom 80% of principals based on the test results).

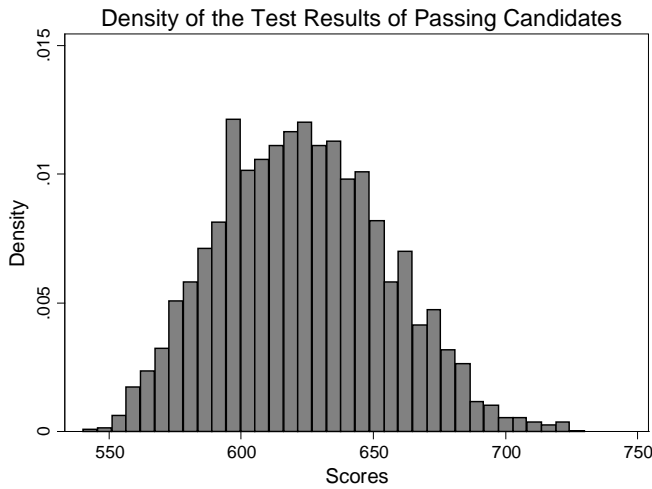
The numbers are stable over the years except for the 2008/2009 academic year when the government extended the years of schooling from 11 to 12 and consequently demand for higher education and associated exams declined. Although there were some schools that fell outside of the regulated extension, e.g. schools for ethnic minorities, 2008 is omitted from the analysis as it represents a small part of the sample.

Table 1. Private and public schools in the NAEC data from 2005 to 2010.

Schools in Georgia	Year						
	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>Total</u>
Private	217	173	198	20	180	204	992
Public Without Principal Replacement	953	994	804	132	833	953	4669
Public with Top 20% Principal	316	326	295	28	346	341	1652
Public with Bottom 80% Principal	226	246	221	19	249	242	1203
Total	1712	1739	1518	199	1608	1740	8516

For the purpose of this analysis, data was obtained from the Ministry of Education and Science on school characteristics such as size, address, share of socially disadvantaged pupils, and the number of teachers for each school. In addition, the ministry provided statistical data on the education reforms such as candidates' registration district, their identifiers, test results, and the names of their assigned/chosen schools based on the top 20 or bottom 80 percent categories. Figure 1 below presents the distribution of all candidates' test results. It is clear that the distribution resembles a normal density function, which might mean that the exam was well balanced.

Figure 1. Distribution of test results of all candidates.



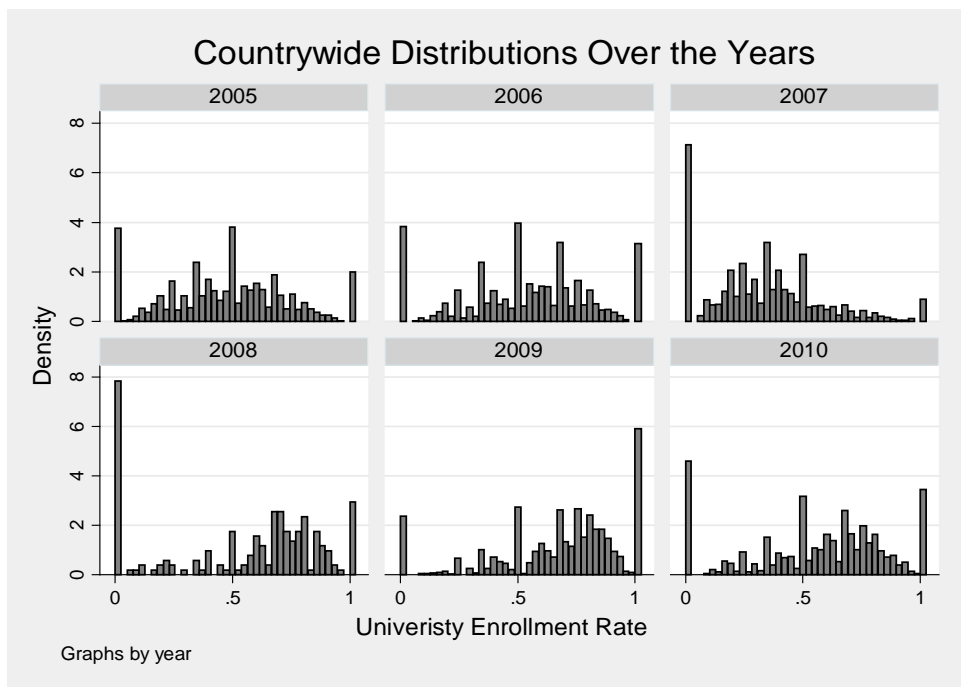
Source: The Ministry of Education and Science of Georgia

Merging these two data sets forms a panel of the schools from 2005 to 2010, which combines all schools with the covariates and the outcome variable. Specifically, the outcome variable is the university enrollment rate attained by the annual cohort of students from a school. It is defined as the ratio of students successfully admitted to university from a particular school out of the total number of university applicants from that school; i.e. the latter being equivalent to the number of the secondary school's graduates that take the NAEC exam. This variable proxies scholastic achievement and measures the size of ability and willingness to continue schooling in higher education. It varies from 0 to 1.

Figure 2 presents the distributions of the university enrollment rates across the country. Following descriptive analysis, it was concluded that the main reason for the considerable numbers of 0s and 1s in the data is mostly due to the high number of very small schools from where only a few students apply to university each year. Schools with five applicants or less

were designated as small schools in the sample. This threshold was determined as optimal since adding another marginal extension of the number (from five to six) does not change the results, and the overall findings become and remain stable over the specification. Hence, smaller schools were omitted from the analysis in order to avoid over/under estimating results. Figure 2 also suggests that the distributions of the university enrollment rates are skewed to the right for 2009 and 2010. While this change could be the outcome of the additional year of study added to all schools (excepting ethnic schools) in 2008, it does not affect the evaluation herein as this effect is averaged/canceled out through the DID methodology.

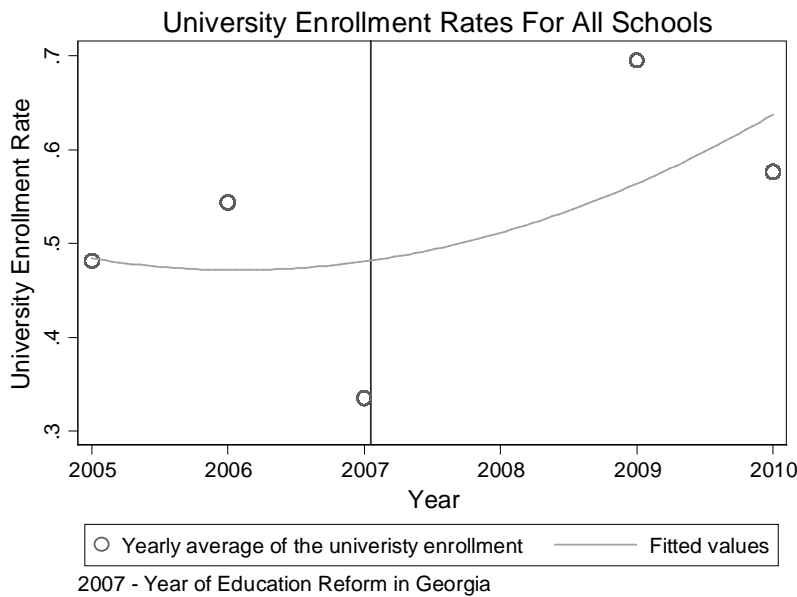
Figure 2. Distribution of university enrollment rates from 2005 to 2010.



Source: The National Assessment and Examination Center of Georgia

Figure 3 plots annual averages of university enrollment rates over the years. Based on the fitted values line, schools in Georgia have been positively trending in terms of the university enrollment rate since 2005. This is accounted for in the analysis through time effects. Further, figure 3.3 shows that the country level average of the university enrollment rate noticeably decreased in 2007. The main reason for this decline is the university accreditation process.¹¹ As places were limited because some universities could not admit students in that year, the rate dropped uniformly for public and private schools.

Figure 3. School level university enrollment rates in Georgia from 2005 to 2010.



¹¹ The Georgian government created new quality control requirements for public and private universities. They were required to meet the new minimum standards during the 2006/2007 school year to be able to continue to enroll students in the 2007/2008 school year and onwards. Many universities did not pass the accreditation program until the following school year.

Source: The National Assessment and Examination Center of Georgia

Empirical Models

Given that the education policy partitioned schools in terms of a clear control group (private schools) and quasi-treatment groups (the three categories of public schools affected by the policy), this study aims to estimate the effect of the education policy on school scholastic achievements (through the proxy of university enrollment rates). To do so, a difference-in-differences methodology is applied (Abadie, 2005; Angrist and Pischke, 2009). The mathematical formulation of the model is the following:

$$y_i = \beta_0 + \beta_1 \cdot period_i + \beta_2 \cdot treated_i + \beta_3 \cdot period_i \cdot treated_i + \gamma X_i + \varepsilon_i$$

where y_i stands for the outcome variable, $period_i$ is a period indicator dummy variable, which equals 0 before the reform and 1 after the policy implementation. The variable $treated_i$ denotes the treatment status of the school i . It attains 1 if the school falls within one of the treatment groups (B, C, and/or D) and 0 if not. A vector of covariates X_i is a set of explanatory variables, which might have explanatory power in the model (size of the school, teacher-student ratio, the percentage of economically vulnerable pupils in the school, location, etc.). Coefficient estimates of β_3 measure the difference-in-difference of the outcome variable for a treatment group. While private schools serve as a clear control, given the mechanism of the reform, the multiple treatment groups can be subdivided into five meaningful treatment groups.

- 1) All public schools = Groups B, C, and D

- 2) Public schools without principal replacements = Group B
- 3) Public schools with replaced principals = Groups C and D
- 4) Public schools with replaced principals from bottom 80% candidates = Group D
- 5) Public schools with replaced principals from top 20% candidates = Group C

Consequently, five different DID regressions have been run.

Since the school panel data includes 2-year time spans before and after the reform, the general DID framework is extended by the addition of interaction terms with respect to time dummy variables. This modification allows us to investigate the dynamics of the outcome variables for each year. This modified version of the DID methodology is as follows:

$$y_i = \beta_0 + \beta_1 \cdot i.year_i + \beta_2 \cdot treated_i + \beta_3 \cdot i.year_i \cdot treated_i + \gamma X_i + \varepsilon_i$$

where all variables remain unchanged with the exception of the period indicator, which is now a specific year indicator. That is, *i.year* is a dummy variable for each year, equaling 1 if for a particular year and 0 otherwise. This modification also allows us to investigate the effect across the years.

After the reform, three types of principals governed the public schools. The principals who did not choose the school themselves because of the lottery (bottom 80%), those who chose preferred schools (top 20%), and those principals who were not replaced by the policy. In order to estimate the effect of another “treatment”, that of random assignment, one must compare the outcomes of the C and D groups of principals (the top 20% that were given target school

preference and the bottom 80% which were assigned randomly) through a Regression Discontinuity Design (Angrist, and Lavy, 1999):

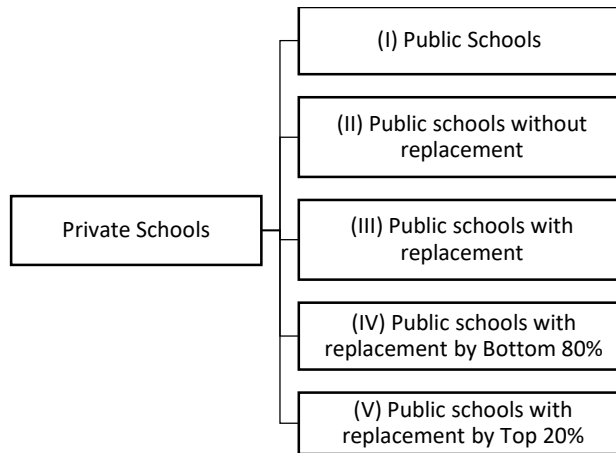
$$y_i = \alpha + \beta \cdot T_i + f(test_i) + \varepsilon_i$$

where y_i is a set of school level characteristics (socio-economic, university enrollment rate, etc.), T_i is the treatment dummy. It equals 1 if the principal is from the top 20% and 0 if not.

Importantly, the observations of the RDD are limited to subjects symmetrically around the threshold. $f(test_i)$ is a polynomial function of the principals' test scores from the selection exam. A linear version, centered at the thresholds, has been applied: $f(test_i) = |test\ result - threshold|$.

Results

As discussed in the methodology section, Georgia's schools were partitioned into different groups based on the inherent characteristics of the education reform. Given that the policy intended to change the principals in all public schools but would have no direct effect on private schools, the five groupings of public schools were used as the treatment groups studied in comparison with the private schools as the control group. To reiterate, the treatment group categorization of the public schools are the following: 1) all public schools, 2) public schools without principal replacements, 3) public schools with replaced principals, 4) public schools with replaced principals from the bottom 80% of candidates, and 5) public schools with replaced principals from the top 20% of candidates. Below is a visual representation.



For each difference-in-difference group pairing, the parallel trend assumption was checked and all divergent covariates were incorporated into the model as control variables. Specifically, all observed covariates were studied as outcome variables and were analyzed to discern whether treatment status made any difference in them. School size, teacher-student ratio, and poverty changed both over time and as treatment status. Therefore they were added to the regressions as control variables in order to avoid misinterpretation of results. The results of the five DID regressions are presented in Table 2, displaying the estimated differences of the impact of the policy for each public school grouping versus the private school control group. Specific year results, along with school fixed effect analyses, are presented in table 3.

From Table 3.2, it is evident that the average public school results deteriorated in terms of university enrollment rates. However, the reason for this decline most likely results from the highly negative outcomes of the public schools where the principals were not replaced. Those schools underperformed significantly after the reform, which is apparent from the second regression results. Comparing the second regression results to the remaining regression results

seems to confirm this explanation. In particular, public schools with principal replacements had increased university enrollment rates by an average of 4% more than the control schools.

Further, the largest part of this increase comes from schools with lottery assigned principals.

Table 2. Coefficient estimates of Difference-in-Differences for each treatment category.

Pairwise comparisons of the private and one of the 5 public school categories	Impact of the Policy	N of Obs. Adj. R-squared
Private vs I (All Public Schools)	-.05** (.02)	7353 .39
Private vs II (Public Schools Without the New Principals)	-.06** (.02)	4767 .29
Private vs III (Public Schools with the New Principals)	.04* (.03)	3447 .29
Private vs IV (Public Schools with Bottom 80% Principals)	.05** (.02)	2338 .34
Private vs V (Public Schools with Top 20% Principals)	.02 (.02)	1790 .29
Notes: Coefficients in all columns are DID regression estimates, robust standard errors are in parentheses; ** and * indicate significance at the 5%, and 10% level, respectively. All regressions control the covariate (size, teacher-student ratio, poverty) if the systematic differences are observed over the groups. 2008 is omitted from the analysis.		

Table 3 shows that by 2010 enrollment rates for public school students declined by an average of 5 percentage points after the reform compared to the control group. However, the magnitude of the effect increases in absolute terms for those students who came from the public schools where principals were not replaced. Their performance relatively worsened by 10 percentage points. The estimates in Table 3.3 also suggest that those public schools where the policy replaced the principal comparatively improved their university enrollment rates by an average of 4%. While the schools with the top 20% replacement principals seem not to differ

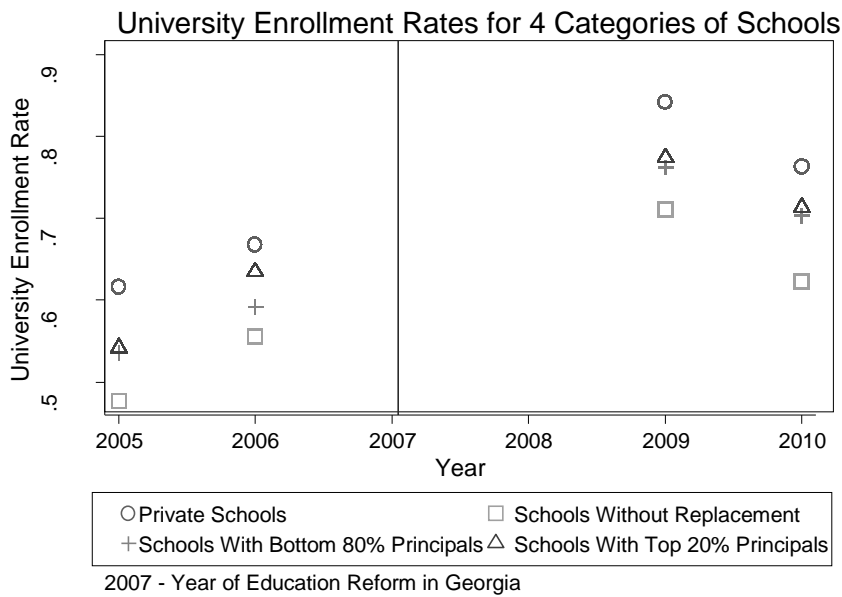
significantly with the control group, the schools with lottery assigned principals appear to have advanced the most, with a 6% increased rate over control on average.

Table 3. Coefficient estimates of Difference-in-Differences for each treatment category, with effects with respect to academic years.

Estimation Method	Pairwise comparisons of the private and one of the 5 public school categories	The Impact of the Policy on the University Enrollment Rate				N of Obs. Adj. R-squared
		Before the Education Policy		After the Education Policy		
		2005	2006	2009	2010	
Difference-in-Differences	Private vs I	-.04 (.032)	-.01 (.02)	-.04** (.02)	-.05** (.02)	7353 .38
	Private vs II	-.03 (.02)	.00 (.03)	-.04* (.03)	-.10*** (.03)	4767 .37
	Private vs III	-.03 (.3)	-.01 (.02)	.03 (.02)	.04** (.02)	3447 .38
	Private vs IV	-.01 (.04)	-.02 (.04)	.08* (.04)	.06* (.03)	2338 .47
	Private vs V	-.05 (0.4)	-.00 (.04)	-.02 (.03)	.02 (.03)	1790 .54
Difference-in-Differences with school fixed effects	Private vs I	-.06** (.03)	-.03 (.02)	-.03 (.03)	-.05*** (.02)	7353 .42
	Private vs II	-.07* (.04)	-.03 (.03)	-.04 (.03)	-.10*** (.03)	4767 .39
	Private vs III	-.07** (.03)	-.03 (.02)	-.03 (.02)	-.01 (.02)	3447 .52
	Private vs IV	.04 (.05)	.08 (.05)	.04 (.06)	.04* (.03)	2338 (.58)
	Private vs V	-.03 (.04)	-.01 (.02)	-.03 (.03)	.07 (.05)	1790 .59
Notes: Coefficients in all columns are DID regression estimates, robust standard errors are in parentheses; ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. All regressions control the covariate (size, teacher-student ratio, poverty) if the systematic differences are observed over the groups. Year 2008 is omitted from the analysis.						

Figure 4 below presents six different years of university enrollment rate dynamics for the different categories of public schools. The scatter plots demonstrate that public schools underperformed in general, while the schools with lottery assigned principals advanced over the years, and the gap between those and private schools narrowed most in 2010.

Figure 4. Dynamics of university enrollment rates for each grouping of schools.



Source: The National Assessment and Examination Center of Georgia

In order to estimate the effect of the policy for schools with lottery assigned principals and those which were chosen by the principals, difference-in-difference-in-differences (DDD) methodology was used. As table 4 presents, the average lottery assigned schools outperform the top 20% principal schools.

Table 4. Difference in DDD regression estimates of the effect of the policy reform

Comparison of two types of public schools	Impact of the Policy	N of Obs. Adj. R-squared
Lottery assigned principals vs top 20% principals	.034* (.019)	3447 .39

Notes: Coefficients in all columns are DDD regression estimates, robust standard errors are in parentheses; ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. Year 2008 is omitted from the analysis.

To identify the underlying effects and understand the difference in the results from groups four and five from the DDD empirical methodology, a regression discontinuity design method was applied using the test score threshold of the top 20% versus the second 20% scorers prior to the reform. That is, the distance from the threshold can go up or down by a maximum of 20% (i.e. the top scorer versus the 40th percentile scorer). Appendix tables A1 and A2 present the RDD regression results, which compare the school-level characteristics for the schools with principals that were given preferential choice and the schools with principals assigned by lottery. The method is conducted around the threshold at both 10% and 20% distances to assess if any differences exist closer to the threshold, while attempting to keep a large enough sample size. Already at the 10% distance, the sample size reaches a questionable lower envelope of 273 observations in total.

The outcomes indicate that the top 20% principals' schools underperformed in terms of university enrollment rates relative to their counterparts, although the result is not statistically significant. Furthermore, at the 10% distance analysis, even the directionality of the effect does

not hold. The variable “Distance to threshold” from Tables A1 and A2 displays the explanatory power of the score distance from the threshold. While it is strongly statistically significant, the effect is almost zero in real terms.

Covariate balance plots over treatment status are plotted in Figures A3 and A4 in the Appendix. They obviously indicate a selection effect. A graphical representation of the discontinuity is given in figure 3.A1 in the Appendix. It demonstrates that there is a discontinuity at the threshold, but this visual difference is not statistically significant.

Discussion

One of the most influential factors in student scholastic achievements is principal quality (Branch et al, 2012). Even though a direct link between principals and students usually does not exist, principals impact students heavily through two different channels. First, they can improve teaching quality in the classroom through teacher turnover, regular monitoring, training, and incentive systems for teachers. Second, principals can improve the overall environment at a school, making it more conducive to learning. For instance, they can increase safety measures, improve staff quality, and introduce student achievement incentives. In addition, a good principal may be able to harmonize the cooperation between schools and parents.

In Georgia, the duties and roles of principals are much the same as in most other countries; however, there is a cultural specificity in terms of the education system and schooling.

The magnitude of the social connections is probably higher than the international average. As a result of these cultural issues, terminating teacher employment as a teaching quality improvement instrument may not be a viable option for those principals with existing social ties. Antithetically, the bottom 80% candidate principals who were assigned by lottery were usually completely foreign to the academic and/or social communities of the schools where they became principals.

Based on the intentions and the mechanism of the education reform, the average replacement principal, including those who managed to return to their schools after passing the exam, were of a higher quality than the original principals. Thus, they should improve the average outcomes of those schools. This should be reflected through a more-or-less monotonically increasing improvement, which should, theoretically, be even greater for the higher scoring principals. Since that was not the case, only three reasonable explanations remain as to why the bottom 80% principals' schools outperformed all of their counterpart schools:

- 1) Both the unchanged principals and the top 20% candidate principals are existing members of the academic and/or social community of those chosen schools and are thus unable to enact necessary reforms due to the strong socialization issues discussed above;
- 2) There is a selection effect in place—the top 20% candidate principals chose schools with higher quality and were then unable to further improve the school's performance despite being high quality principals;

- 3) The unchanged principals remaining in predominantly lower-performing schools were under-qualified or unmotivated to improve those schools before their anticipated replacement in the second round of the reform in 2011.

While the covariate plots (in the Appendix) and the RDD results of the currently available data seem to confirm that all three of these effects are at work in this case (otherwise there would be a far greater and more significant jump at the threshold) it is not possible to distinguish amongst these effects and their magnitudes.

This lack of identification is due in part to the fact that the 2007 reform was not successful in replacing all the principals in the country's public schools. This failure automatically affected the behavior of the remaining school leaders, particularly since those principals who remained due to the failed process were informed that the government would replace them four years later. The DID regression results show that those schools were seriously negatively affected in terms of the university enrollment rate proxy. This means that this policy reform was detrimental to half of the public schools and their students. While this negative spillover effect of the reform was not intended, it provides one of the key lessons for the designers and initiators of any such future reforms elsewhere.

Conclusion

This research attempts to elucidate whether a principal really matters and, if so, does leadership make a sizable difference in educational outcomes. Specifically, it evaluates the

impact between the quality of a principal (in terms of his/her standardized exam results) and student educational outcomes (in terms of standardized university admissions). It does so by analyzing and numerically documenting the effect of this very unique education policy measure (the sharp replacement and random assignment of principals) on the Georgian public school system at the secondary education level. The main finding is that the new principals improved university enrollment rates more than the control schools by an average of 4%, with the majority of this significant increase coming from schools with lottery-assigned candidate principals.

Identifying the effectiveness of this reform might play a significant role in policy-making decisions, particularly in developing countries with similar characteristics and predicaments in their education systems. While there is a relatively sizeable body of research on the effectiveness of principals in OECD countries, to this researcher's knowledge, this work represents the first study in Georgia and the Commonwealth and Independent States (CIS). Further, this paper is important as it provides a pioneer study on an uniquely large-scale and contributes to understanding the somewhat elusive area of education economics. The findings can materially contribute to ongoing academic and political debates about how to improve educational outcomes in public schools and could be useful for policy makers in both developing and developed countries. Indeed, it now seems clear that the lottery mechanism may have a significantly greater positive effect than a preference-based allocation of principals and could be a key element in any similar future reforms, particularly in any country where education corruption, political influences, and/or social ties are of concern.

As it is not possible to disentangle the reform's effects with the currently available data, this research should be extended once the reform is completed and sufficient time has passed to allow for delayed effects to occur. A follow up study that would use the outcome data from the second (or additional) phase(s) of this policy reform could then be used to disentangle and properly identify the individual magnitudes of the quality, lottery, and selection effects that make up the current results of the two different groups of new principals described in the study. The results of the extended study could then provide more comprehensive policy design recommendations.

3.9 References

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A Appendix

Table A1: Effect of school choice on university enrollment rates for schools with Top 20% and Second 20% scoring principals

	Type of Principal, 1 if Top 20% and 0 if Bottom 80%
University Enrollment Rate	-.01 (.01)
Distance to threshold	.0008 *** (.0002)
Teacher-student ratio	.003 * (.002)
Location	.10*** (.01)
Poverty Ratio	-.22*** (.04)
Notes: Coefficients are RDD regression estimates, robust standard errors are in parentheses; ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. Regression includes linear distance to the threshold as well as control variables. Number of observations is 535 and Adj. R-squared equals 0.1. Location refers to the dummy variable which equals 1 if the school is in a city and 0 otherwise.	

Table A2: Effect of school choice on university enrollment rates for schools with principals scoring within 10% above and below the threshold

	Type of Principal, 1 if Top 20% and 0 if Bottom 80%
University Enrollment Rate	.02 (.03)
Distance to threshold	.0005** (.0003)
Teacher-student ratio	.003 (.003)
Location	.11** (.02)
Poverty Ratio	-.27*** (.04)
Notes: Coefficients are RDD regression estimates, robust standard errors are in parentheses; ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. Regression includes linear distance to the threshold as well as control variables. Number of observations is 535 and Adj. R-squared equals 0.14. Location refers to the dummy variable which equals 1 if the school is in a city and 0 otherwise.	

Figure A1: University enrollment rates for public schools with top 20% and second 20% scoring principals, respectively

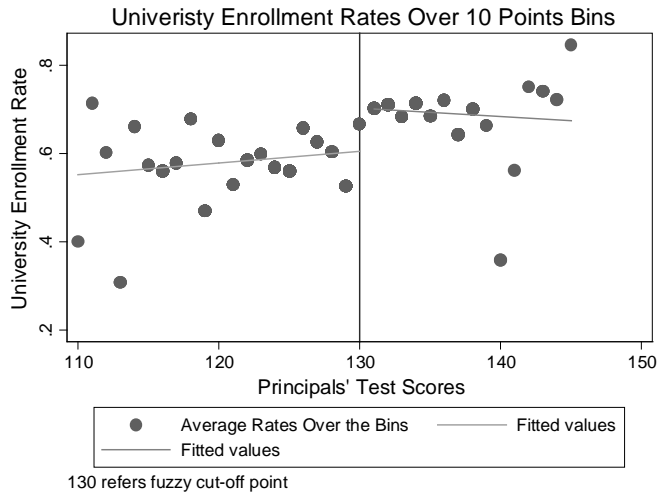


Figure A2: University enrollment rates for public schools with principals scoring within 10% above and below the threshold, respectively

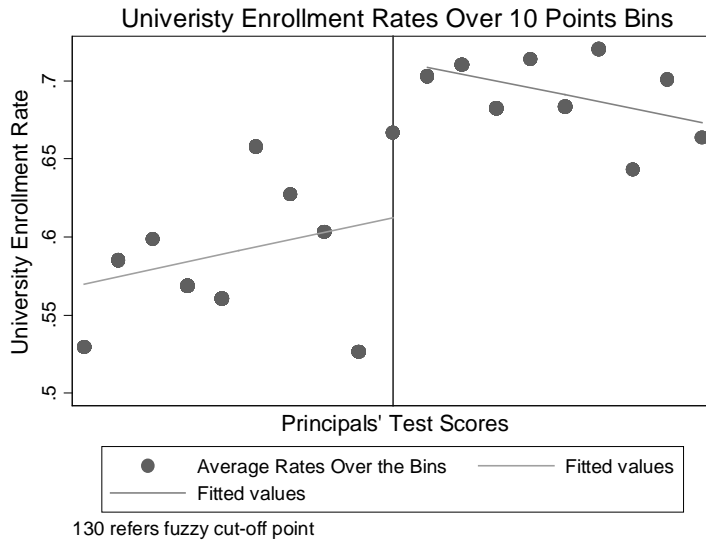


Figure A3. Covariates plots over the types of principals, top 20% and bottom 80%.

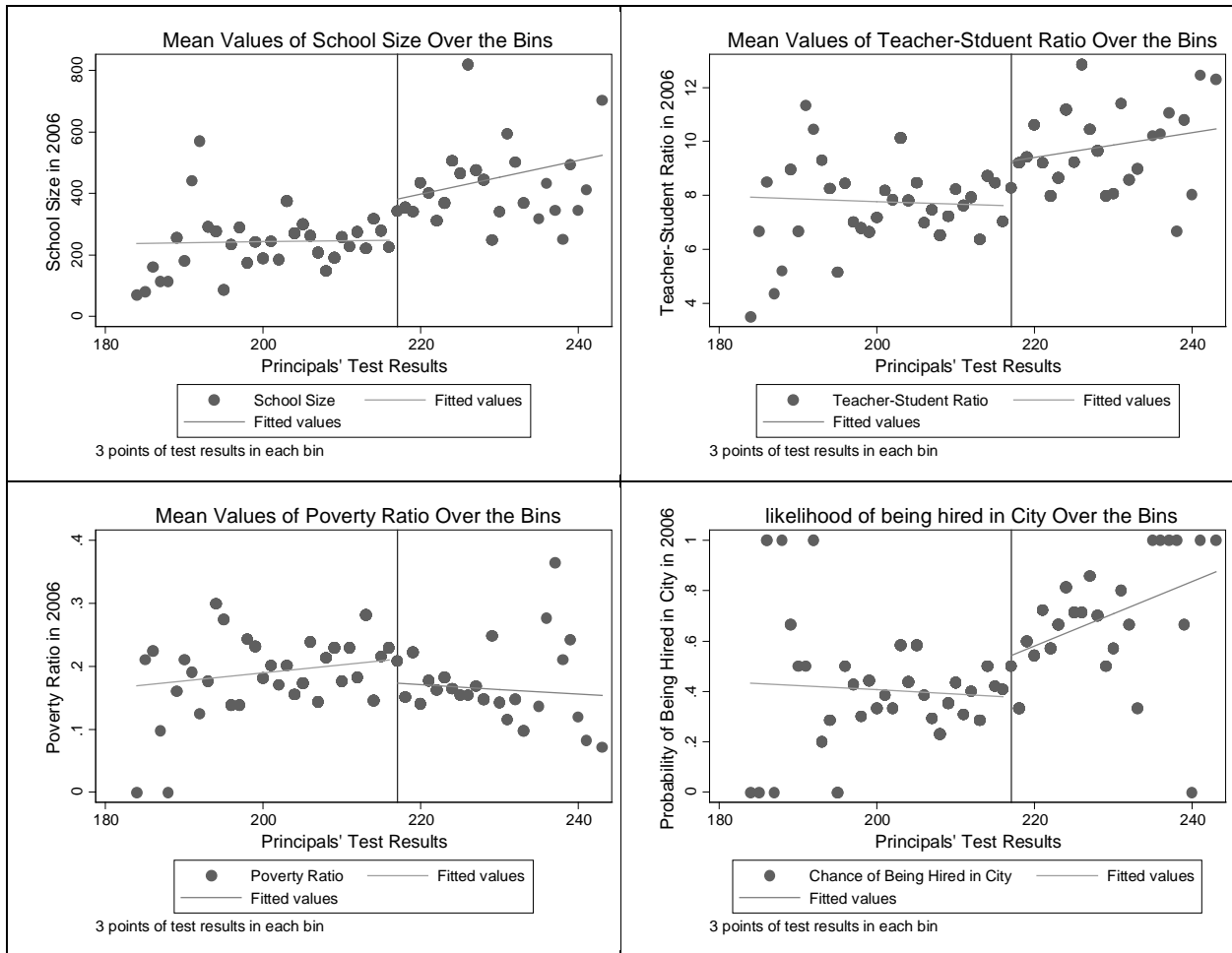


Figure A4. Covariates plots over the types of principals, top 20% and second 20%.

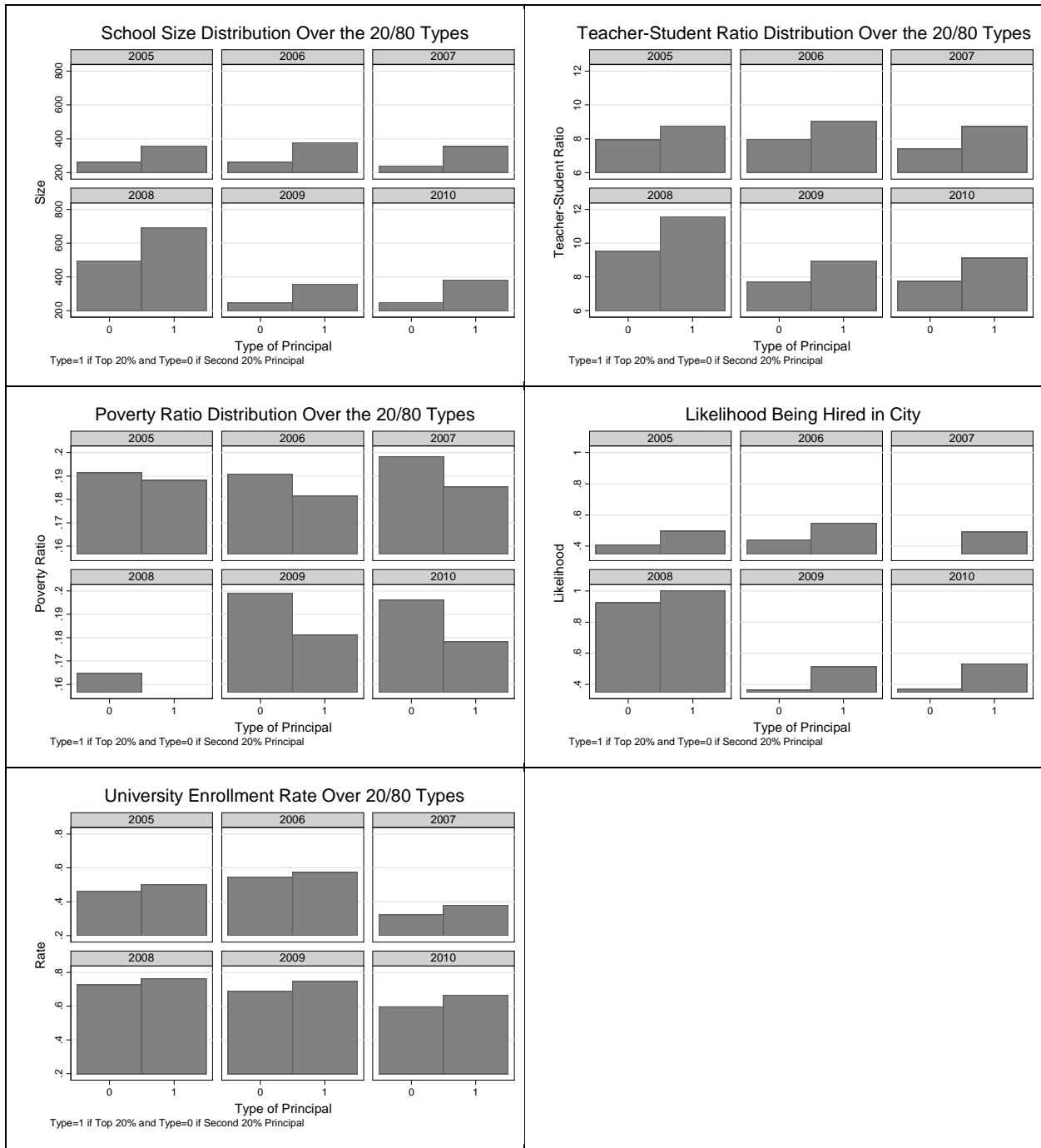


Figure B1: Dynamics of university enrollment rates for each grouping of schools.

